United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Acquisition and Technology, Committee on Armed Services, U.S. Senate

For Release on Delivery
Expected at
9:30 a.m.,EST
Wednesday,
March 18, 1998

DEFENSE ACQUISITION

Improved Program Outcomes Are Possible

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GAO/T-NSIAD-98-123

Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss issues facing the Department of Defense (DOD) in its acquisition of weapon systems, related spare parts, and other goods and services. In response to the many changes that have been witnessed in the defense acquisition environment over the last few years, DOD has begun broad-based changes to its acquisition and contracting processes. However, weapon programs continue to have questionable requirements; unrealistic cost, schedule, and performance estimates; and strategies that begin production before adequate testing has been completed. This discussion of acquisition issues is well-timed, as DOD implements plans to increase its procurement budget to $60 billion in fiscal year 2001—a 40-percent increase over last fiscal year's budget.

My testimony focuses on a different approach to improving weapon acquisition outcomes based on best commercial practices and an understanding of the acquisition culture. My testimony also includes some observations on (1) DOD's management of its acquisition workforce and organization, (2) DOD's experience with commercial pricing of spare parts, (3) the effectiveness of DOD's mentor-protege pilot program, and (4) federal agencies' use of multiple award task- and delivery-order contracts.

Results in Brief

Improved outcomes from the weapon systems acquisition process—that is, acquiring systems better, cheaper, and faster—are possible if the incentives that drive behaviors are changed. The best commercial companies have found processes and decision-making practices that are based on knowledge and focused on production to be successful. Employing such processes and practices can improve weapon acquisitions if DOD and the Congress are able to foster an environment that provides program managers with incentives for applying best practices. In our February and March 1998 reports, we recommended that the Secretary of Defense separate technology development from product development, send signals through decisions on individual programs that encourage acquisition managers to identify unknowns and ameliorate their risks early in development, and develop and disseminate throughout DOD and the defense industry a policy that promotes productive supplier relationships and their importance to improving program outcomes. In addition, we asked the Congress to consider supporting these efforts through its funding and oversight mechanisms.

Over the last several years, the Congress has mandated cuts in DOD's acquisition workforce and called on DOD to submit plans to streamline and restructure its acquisition organizations. DOD has been able to reduce the acquisition workforce, but it has had more difficulty changing the structure that underlies decision-making in the acquisition process. We have previously reported that the connection among DOD's acquisition workforce, organizations, and outcomes of the acquisition process should be considered in making changes.

For an increasing number of sole-source spare parts, DOD is transitioning from a cost-based pricing environment to a market-based or commercial pricing environment where price analysis is the principal means used to negotiate the reasonableness of prices. Regarding sole-source, commercially priced spare parts for which DOD is the predominant buyer, some DOD contracting personnel expressed concerns about (1) how to determine whether the prices offered are fair and reasonable, (2) future contract negotiations where recent cost-based historical prices may not be available, and (3) the sometimes conflicting pressures between obtaining fair and reasonable prices and negotiating contracts in time to meet customer needs and avoid backlogs. So far, our work indicates that while some contractors are now offering commercial prices that are significantly higher than DOD paid in the past, there are some questions about how well contracting officers understand the basis of such prices.

DOD has spent over $200 million on a mentor-protege program to provide incentives for major DOD contractors (mentors) to furnish disadvantaged small business owners (proteges) with assistance designed to enhance their capabilities and increase their participation as suppliers under DOD, other federal government, and commercial contracts. However, DOD lacks information needed to determine whether the program is effective. Strengthened performance reviews could ensure that sufficient and reliable information is available to assess the program's effectiveness.

Our work on multiple award task- and delivery-order contracts shows that federal agencies are not consistently achieving competition when placing orders against these contracts. We also found that the fees charged to agencies that place orders on another agency's contract varied greatly. Weaknesses in agency accounting and management systems prevented us from determining if the fees were reasonable. We found that the use of multiple award contracts did not impair small business' ability to compete for such contracts.

The Need for a Different Approach to Improving Weapon Acquisition Outcomes

This morning we will not focus on individual weapon system problems; rather, we will concentrate on the underlying reasons for such problems and what can be done about them. In two recent reports prepared at the request of this Subcommittee,[1] we identified several commercial practices in the areas of product development and supplier relationships that have the potential for significantly improving weapon system outcomes. Of particular note are the different incentives we found that operate in the two sectors and their primacy in determining program management practices. Simply put, practices are adopted and persist because they work—they help programs succeed in their environment. Thus, the way to get lasting reform is to realign the incentives of the weapons acquisition process with desired program outcomes; specific practices can then show the way to better outcomes. Changing these incentives will take the efforts of the Congress as well as DOD and the services, for all participants in the acquisition process influence its incentives.

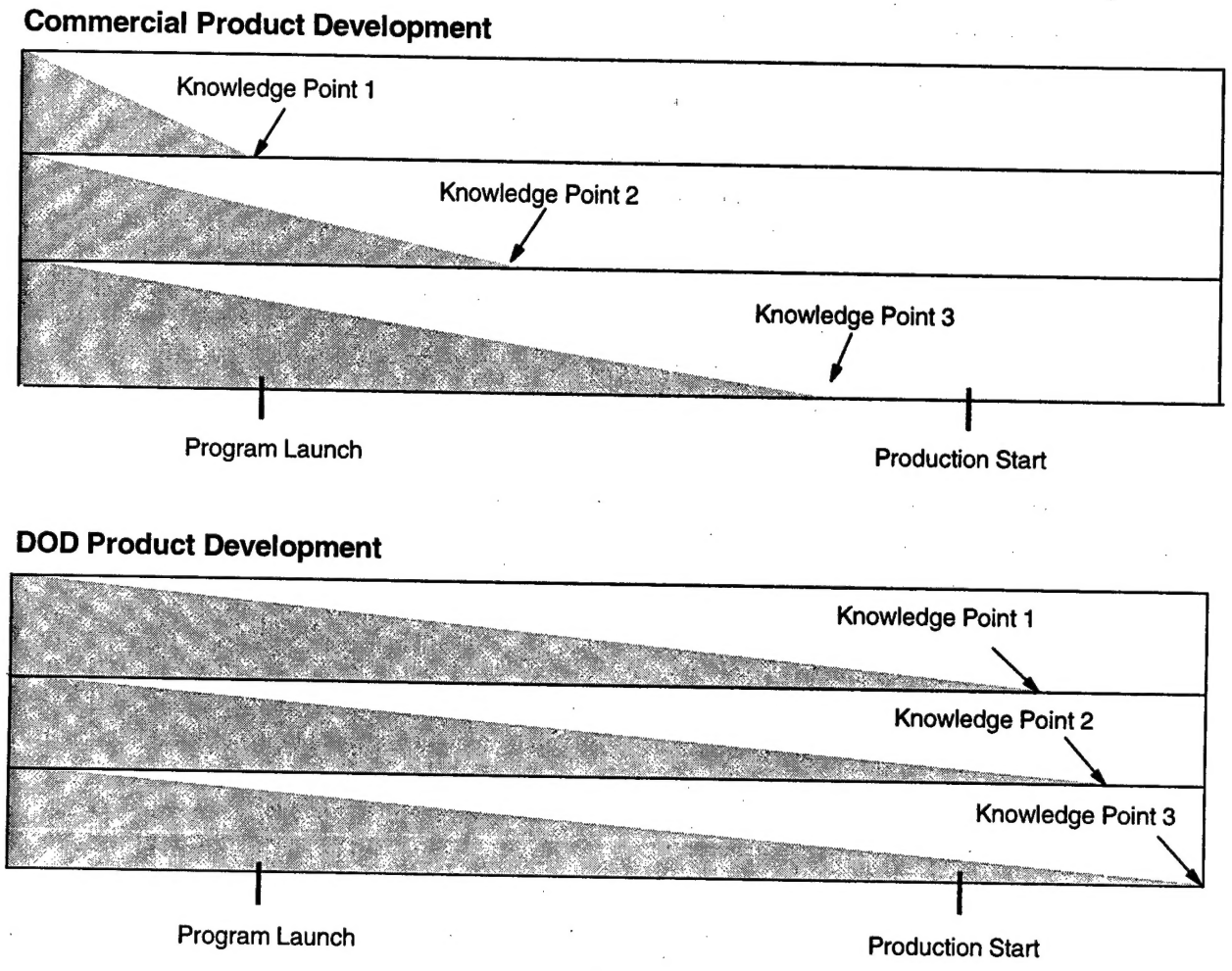
Clear Differences Between Best Commercial Practices and Weapon Acquisition Practices Exist

Our work on the transition of major products to production and on the management of suppliers shows that best commercial practices and DOD practices differ considerably. Before discussing these differences, let me clarify that we do not hold the view that commercial is good and DOD is bad. Not all commercial firms exhibit best practices and the leading firms make their share of mistakes. Also, we found some promising practices in weapon systems that could have application to other programs.

In our transition to production work, we characterized knowledge on product developments in terms of three junctures: when a match is made between the customer's requirements and the available technology, when the product's design is determined to be capable of meeting performance requirements, and when the product is determined to be producible within cost, schedule, and quality targets. For the purposes of comparing commercial and DOD product developments, we have characterized the points at which virtual certainty of each of these aspects of a product is achieved as a "knowledge point." Figure 1 illustrates the three knowledge points and the differences between the commercial and military product developments in terms of when they attain knowledge.

[1]Best Practices: Successful Application to Weapon Acquisitions Requires Changes in DOD's Environment (GAO/NSIAD-98-56, Feb. 24, 1998) and Best Practices: DOD Can Help Suppliers Contribute More to Weapon System Programs (GAO/NSIAD-98-87, Mar. 18, 1998).

Figure 1: Comparison of Three Key Knowledge Points for Commercial and Military Product Developments



Knowledge Point 1: Knowledge that a match exists between technology and requirements.
Knowledge Point 2: Knowledge that the design will work as required.
Knowledge Point 3: Knowledge that the design can be produced within cost, schedule, and quality targets.

Commercial firms gain more knowledge about a product's technology, performance, and producibility much earlier in the product development process than DOD. Product development in commercial ventures is a clearly defined undertaking for which firms insist on having the technology in hand to meet customer requirements before starting. Once underway, these firms demand—and get—specific knowledge about a new product before production begins. The process of discovery—the accumulation of knowledge and the elimination of unknowns—is completed for the best commercial programs well ahead of production. Not having this knowledge when demanded constitutes a risk the firms find unacceptable. Immature or undeveloped technology cannot meet these demands and is kept out of commercial product development programs; this technology is managed separately until it can meet the demands for product development.

In contrast, DOD programs allow technology development to continue into product development. Consequently, the programs proceed with much less knowledge—and thus more risk—about required technologies, design capability, and producibility. The programs' discovery process persists much longer, even after the start of production. Not having the same level of knowledge as commercial firms explains much of the turbulence in DOD program outcomes as the transition to production is made. It is a predictable consequence that can be forecast early by the use of knowledge points or other metrics. It is complicated by the fact that although DOD accepts more unknowns on its programs than commercial firms, it understates the risks present.

Knowledge Point 1: Customer Requirements and Technological Capability Are Matched

To minimize the amount of technology development that occurs during product development, the companies we visited employ a disciplined process to match requirements with technological capability before the product development process begins. This process is grounded in production realities that demand proof that the technology will work and can be produced at an acceptable cost, on schedule, and with high quality. The companies bring proven technological knowledge to the requirements process in the form of current, high-fidelity information from predecessor programs, people with first-hand experience on those programs, and new technologies deemed mature as a result of having "graduated" from a disciplined technology development and screening process. In addition, they communicate extensively with customers to match their wants and needs to the firms' available technology and ability to manufacture an appropriate product. They do not stray far from their technological foundation.

We found examples of best commercial practices for matching requirements to technology at Boeing, Hughes, and Ford. Boeing communicated with the airlines to set achievable requirements for the 777-200 airplane and tested the design early. Boeing also applied lessons learned from past programs to (1) ensure that technology was mature before the 777 was launched[2] and (2) eliminate additional requirements once the development program began. Hughes used a technology development process that graduated new technologies from concept into a product development program, enabling the firm to make what it saw as quantum performance increases with mature technologies on its new satellite, the HS-702. Ford uses its technology deployment process and "Wall of Invention" to separate immature technology from a new product's development.

DOD programs did not attain a match between technology and requirements at the time of launch. DOD accepted varying—but consistently higher—degrees of technological risk on the four programs we reviewed. Some examples from the F-22 illustrate that a match between requirements and technology is still not certain in that program. The F-22 program includes 10 newly developed derivatives of existing materials that are important to its low-observability feature. The performance and maintainability of these materials will not be completely verified until 2 years after production begins. Similarly, it will be after production before it is certain that the avionics software, which features a level of integration not previously achieved in a fighter, is a match for the performance requirements. The F-22 engines have many advanced features to meet aggressive performance requirements and program officials acknowledge that it is still unclear whether the engines will meet all of the requirements. Leading commercial firms do not do this—they do not tolerate basic unknowns about the performance of a new product to persist this long. In fact, resolving these kinds of unknowns is a precursor to starting a commercial product development.

Another example that illustrates the different knowledge standards are the commercial and DOD decisions made on a lightweight aircraft material—aluminum lithium. Boeing had initially decided to use the alloy on its 777-200 aircraft but rejected its use early in development because it was expensive, its manufacturing processes were not well understood, and its availability was limited. It was willing to pay a weight penalty rather than accept the unknowns associated with aluminum lithium. DOD

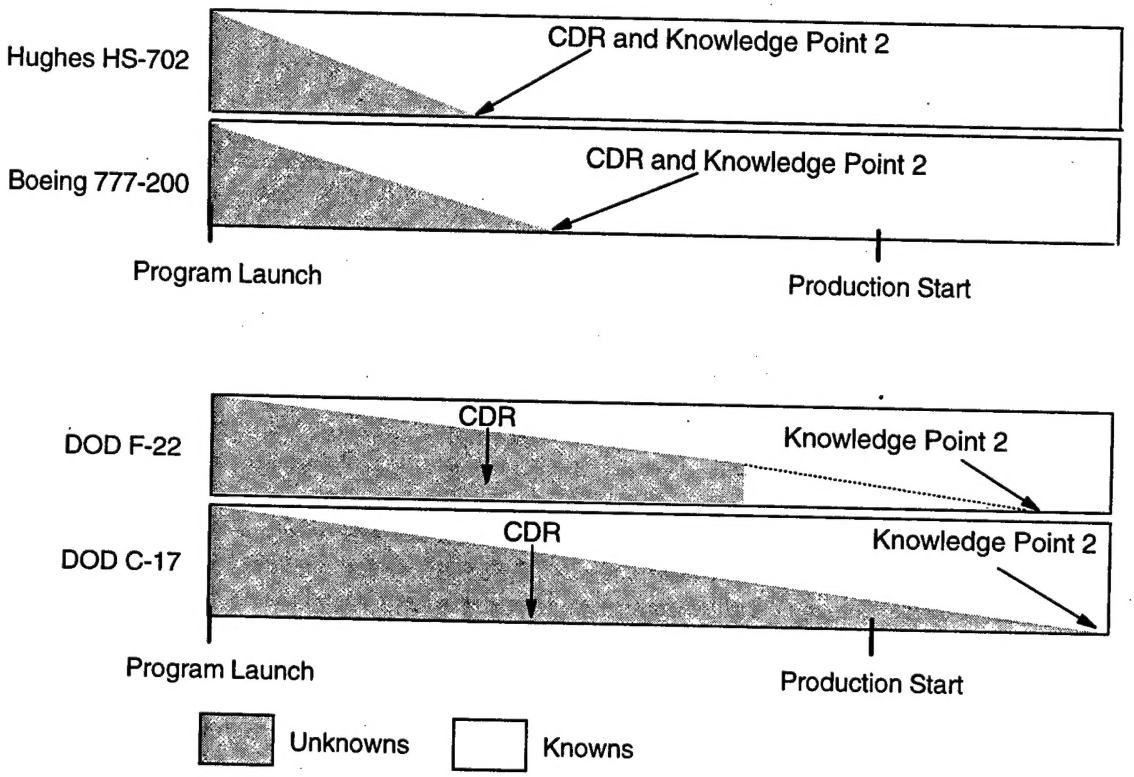
[2]We define program launch or start as the point at which organizations define a product's performance, cost, and schedule estimates and commit to making the financial investment needed to complete development and bring the product into production.

accepted these risks and used the alloy on the C-17 aircraft. The first production aircraft contained 2,200 pounds of the alloy. Its application proved unsuccessful as some of its unknowns became problems. Consequently, the decision was made to discontinue aluminum lithium and it will be phased out of the program by the 51st production airplane.

Knowledge Point 2: The Design Will Perform as Required

The commercial firms we visited achieved near certainty that their product designs would meet customer requirements and had gone a long way to ensure that the product could be produced before the halfway point of product development. Both DOD and commercial firms hold a critical design review (CDR) to review engineering drawings, confirm the design is mature, and "freeze" it to minimize changes in the future. The completion of engineering drawings and their release to manufacturing organizations signify that program managers are confident in their knowledge that the design performs acceptably and is mature. The drawings are critical to documenting this knowledge because they are not only precision schematics of the entire product and all of its component parts—they also reflect the results of testing and simulation and describe the materials and manufacturing processes to be used to make each component. Both DOD and commercial companies consider the design to be essentially complete when about 90 percent of the engineering drawings are completed. Figure 2 compares what knowledge, in the form of released drawings, was in hand at the time of the critical design review for the commercial and DOD programs we reviewed.

Figure 2: Comparison of When Commercial and DOD Programs Achieve Knowledge About Their Product's Design



Commercial firms such as Boeing and Hughes told us they typically had over 90 percent of these drawings available for the CDR. Boeing began releasing engineering drawings when product development began in 1990 and completed the release process in 1992, less than 2 years later. Once the CDR was complete, Boeing strictly enforced the design freeze for the 777-200. For example, Boeing incorporated a customer requirement to include folding wingtips, along with the supporting bulkheads, into the 777 design at a cost of nearly $40 million. Later, the customer decided the folding wingtips were not necessary; however, Boeing left the bulkheads

in the wings anyway because all of the engineering drawings were completed and the risk of introducing changes, even though the changes would have saved weight, was considered too high relative to cost and schedule targets.

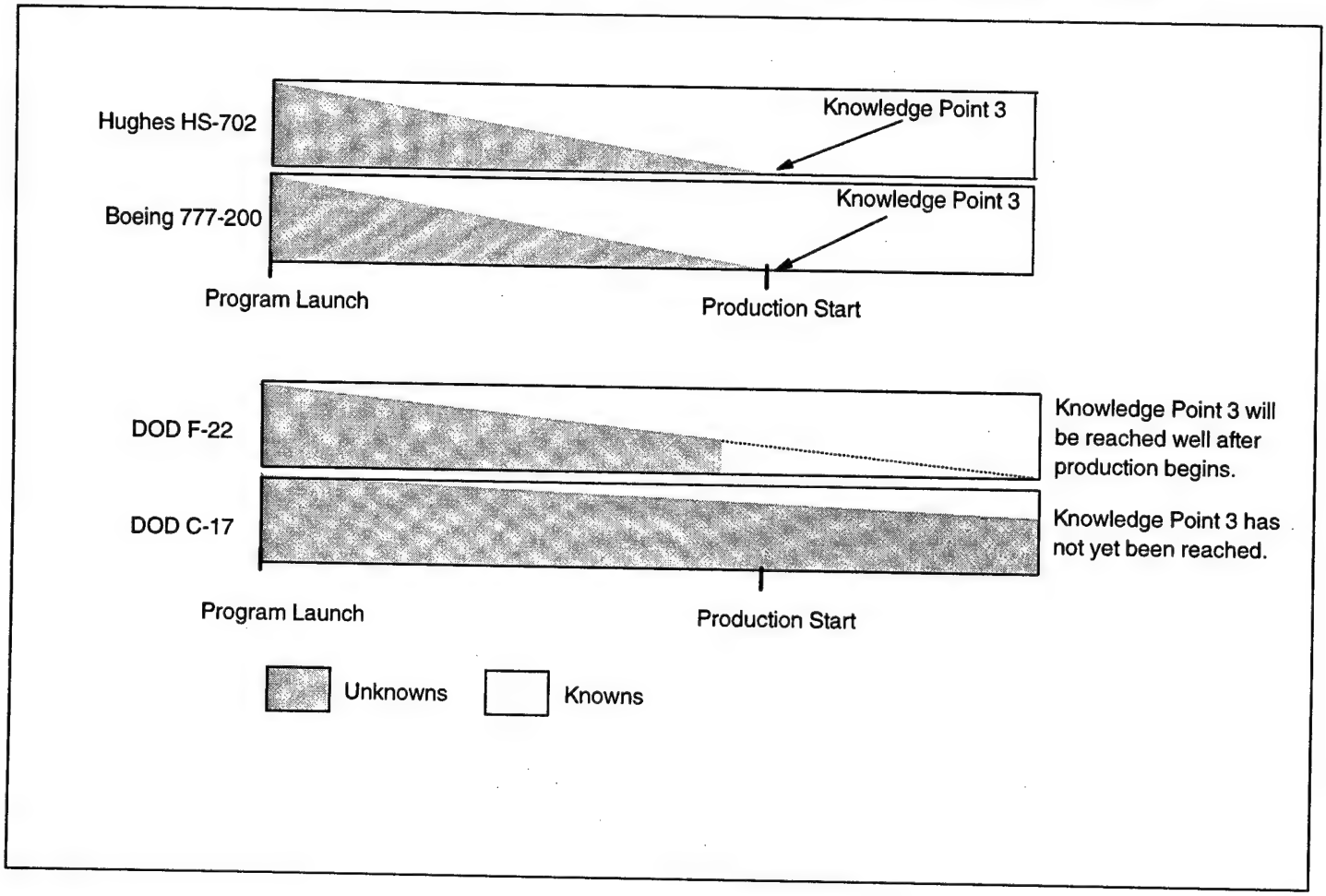
The C-17 and the F-22 programs had less knowledge—in the form of test results or engineering drawings—about their designs than commercial companies did at the time they held their CDRs. The programs did not get or were not projected to get to the same level of completion on the drawings until later in the development cycle, which placed greater reliance on the lesser information available at the time of the review. Specifically, the C-17 program had less than 60 percent and the F-22 program less than one-third of the drawings available for the CDR. Over one-fifth of the C-17's drawings became available after production began, and the aircraft experienced a number of problems in production as difficulties with the design were worked out. Several key technologies are still unproven on the F-22, and some will not be proven out until after 40 aircraft have entered production. Nonetheless, the risks of proceeding with the rest of development as planned at the time of the CDRs for both programs were deemed acceptable.

Even though it is still too early to predict outcomes on the AIM-9X missile and the Joint Direct Attack Munitions (JDAM) programs, their prospects appear promising because they have chosen mostly proven technology from existing programs to achieve performance requirements.

Knowledge Point 3: Production Units Will Meet Cost, Quality, and Schedule Objectives

The companies we visited reached the point at which they knew that manufacturing processes would produce a new product conforming to cost, quality, and schedule targets before they began fabricating production articles. Reaching this point meant more than knowing the product could be manufactured; it meant that all key processes were under control, such that the quality, volume, and cost of their output were proven and acceptable. As indicated in figure 3, the DOD programs demanded less proof of the design's producibility before the product transitions to production.

Figure 3: Comparison of When Commercial and DOD Programs Achieve Knowledge That Processes Can Produce a Product



The commercial firms relied on known manufacturing processes and statistical process control data to achieve this knowledge early and, in fact, had all their key processes under statistical control when production began. The ability to establish control for key processes before production began was the culmination of all the practices employed to identify and reduce risk. All of the companies we visited agreed that knowledge about technology and design up front in the process makes the control of processes possible and the transition to production smooth.

The C-17 program began production in 1989 and still has less than 13 percent of its key manufacturing processes in control. The F-22 program is currently faring better than the C-17: The contractor believes it has almost 40 percent of its key manufacturing processes in control, 2 years before production is scheduled to begin. However, the program does not plan to have all key processes in control until about 4 years into production. Both programs experienced basic producibility problems that were not discovered until late in development or early in production. Problems occurred despite completing production readiness reviews that were intended to reduce producibility problems and having exit criteria to ensure that risks were acceptable and enough knowledge had been gained to enter the next development phase.

The C-17 program discovered major design changes of the wings, flaps, and slats were required after the critical design review. These changes caused costly changes to processes; forced the manufacturers to develop workaround plans; and resulted in high rates of scrap, rework, and repair. The production preparations for the F-22 illustrate the limitation of a review mechanism when a substantial amount of knowledge is unattained. The initial production readiness review, held in 1995 when only about one-third of the engineering drawings were released, did not report any high risks in manufacturing or producibility. In 1996, an independent team mandated by the Air Force reviewed the program and discovered numerous manufacturing and producibility problems, such as underestimated complexity in manufacturing processes, understated labor requirements, immature definition of avionics flight test requirements, and concerns about software integration.

Management of Suppliers

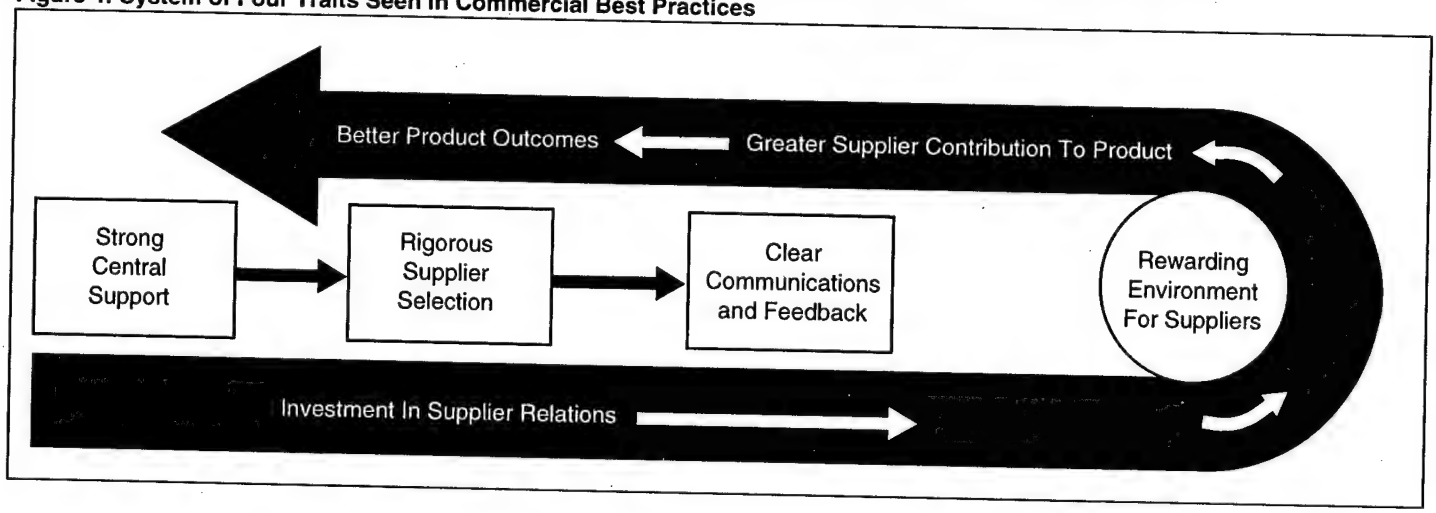
Leading commercial companies have found that more cooperative business relationships with suppliers have led to lower costs, higher quality, and shorter cycle times. In both commercial and defense products, suppliers account for much, if not most, of the product content and technical innovation. In our review of supplier relationships, we also found key differences between best commercial practices and DOD practices. The best practices of commercial firms recognized as industry leaders in the area of supplier relationships can be aggregated into four traits:

- providing the central support necessary to optimize supplier relations, which were seen as essential to maximizing product success;
- implementing a rigorous supplier selection process, which created a manageable pool of strong suppliers;

- creating channels for open communication and continuous assessment of performance for both customer and supplier; and
- creating an environment whereby the suppliers also benefited from superior performance.

The leading commercial firms go beyond simple supplier relationships that are limited to the purchase of goods and services in return for payment. Their relationships evolved to the sharing of information and interaction on a variety of business functions in a joint effort to make a better quality product, more quickly, and less expensively. Both the firm responsible for the complete product and its suppliers benefited from the process. Thus, we see the four traits as the components of a self-sustaining system, shown in figure 4.

Figure 4: System of Four Traits Seen in Commercial Best Practices



We discussed supplier relationships with several defense prime contractors and did detailed work on the Brilliant Anti-armor Submunition program, referred to as BAT, and the JDAM program. We found that in a more traditional program, like BAT, the four traits do not comprise as powerful a system as is formed by the best commercial practices. While a number of the practices that make up the middle two traits have been adopted, their impact on the BAT program was blunted by weaknesses in central support and providing a mutually rewarding environment. The commitment of the prime contractor to improve supplier relationships was not perceived by some key suppliers as having been much more than

procedural changes. Part of the reason is that although DOD shares responsibility for determining what is important in managing an individual program, its traditional approach has been to maintain an "arm's length" relationship with prime contractors and have little involvement with suppliers. On the JDAM, DOD was able to create a better environment for fostering mutual benefits between defense prime contractors and their suppliers.

Differences in Practices Reflect Different Incentives

The differences in the practices employed by the leading commercial firms and DOD are not necessarily explainable by differences in tools, techniques, or talent. Rather, the differences in the actual practices reflect the different demands imposed on programs by the culture or environment in which they were managed. Indeed, the way success and failure are defined for commercial and defense product developments differs considerably, which creates a different set of incentives and different behaviors from the people managing the programs. Specific practices take root and are sustained because they help a program succeed in its environment. In this sense, practices are adopted because they work—not because they are textbook solutions. In our transition to production review, we observed that, with the possible exception of having more experience with repeated product developments than a DOD program manager, commercial program managers were not better or more ethical than their DOD counterparts. On supplier relations, we noted that it is a major undertaking for a firm to commit the resources to implement an active supplier policy. Such a commitment is not based on altruism or management theory; rather, the commitment comes from the desire to maintain a competitive edge in preserving or increasing a firm's market share.

Commercial Practices Are Driven by the Customer's Acceptance of the Finished Product

The commercial firms we contacted launch a product development program only when a solid business case can be made. The business case basically revolves around the ability to produce a product that will sell well enough to make an acceptable return on investment. The point of sale occurs after product development is complete; program success is determined in production when the customer buys the finished product. If the firm has not made a sound business case or has been unable to deliver on one or more of the business case factors, it faces a very real prospect of failure in the form of the customer "walking away." Production is a dominant concern throughout the product development process and forces discipline and tradeoffs in the design process. This environment encourages realistic assessments of risks and costs; doing otherwise would threaten the business case and invite failure. For the same reasons,

the environment places a high value on knowledge for making decisions. Incentives favor identifying unknowns early, designating them an appropriate high risk, and aggressively eliminating them. Practices, such as achieving statistical process control before production, are adopted because they help ensure success.

Boeing described the business case for the 777-200 product development as a "money wheel" that must be balanced across all of its factors. These factors include a market opportunity, a product whose technical features can satisfy the market, available investment capital, a cycle time short enough to get the product to market on time, and a unit production cost that will yield an acceptable return on investment. Boeing informed us that if any factor gets out of line, either through estimating errors or changing conditions, the "wheel" will not turn, and profitability—and perhaps corporate reputation—could be lost. The program manager is judged by these standards, unlike in DOD.

Once a company decides to launch a product development, strong incentives—both positive and negative—serve to keep the programs on track. To meet market demands, leading commercial companies build relatively short cycle times into decisions to begin a product's development. Boeing's 777-200 went to production less than 5 years after development began, Hughes' HS-702 took about 26 months, and Chrysler developed its Dodge Durango sport utility vehicle in 24 months. These short timeframes make the day of reckoning—sale of the produced item to the customer—close at hand. Consequently, production—on time, at rate, at cost, and with quality—looms as a near-term reality that continues to greatly influence subsequent design and configuration decisions within the framework of the business case. The incentives that operate in the commercial environment encourage program managers to want risks identified early, be intolerant of unknowns, and not rely on testing as the main vehicle for discovering the performance characteristics of the product. By protecting the business case as the key to success, program managers are conservative in their estimates and aggressive in risk reduction. Ultimately, preserving the business case enables them to say "no" to pressures to accept risks or unknowns.

DOD Practices Reflect the Need to Succeed in Funding and Managing the Development Effort

The business case for a major weapon system is quite different. It is characterized by a stated need for a military capability; a proposed weapon system for which the demands of a successful launch dictate optimistic technological, cost, and schedule estimates; and a development

effort for which candor about progress is curbed by the competition for continued funding.

Traditionally, needs for new weapons have been generated by individual branches within each service. Once a need has been established, a product development vying for launch faces intense competition for initial funding. DOD typically defines and launches a program years earlier in the process than a commercial product development, and thus, the case for the product is made when much less is known about technology, cost, and schedule. The knowledge required to make the business case to launch a commercial product development is generally not available for a DOD program until well into the engineering and manufacturing development phase. In a very real sense, the point of sale begins much earlier on a DOD program and recurs more often because the customer (DOD and the Congress) pays for the product on an annual installment basis from program launch. Success, then, for most of the product development cycle, is measured in terms of ability to secure the next installment. Because this approval must be won every year, it creates incentives to make the program's case look attractive.

The competition for funding at the time of launch encourages aspiring DOD programs to include performance features and design characteristics that rely on immature technologies. Untempered by knowledge to the contrary, the risks associated with these technologies are deemed acceptable. Because production can be 15 years from the launch decision, it is difficult for production realities and concerns to exert as much influence on a DOD product development as they do on commercial products. Instead, design features and performance are more dominant. More unknowns are accepted on a DOD program, and their attendant risks are often understated. This combination, which can be devastating to a commercial business case, can help a weapon system program get launched and survive.

Other pressures on DOD programs at launch make tough demands for knowledge that does not yet exist. A product development deemed worthy cannot be launched unless development and production funding is available over the right time period. The product's development and production cost, as well as timing, must fall within available funding. Because DOD relies largely on forecasts of cost, schedule, and performance that are comparatively soft at this stage, funding competition encourages the cost and schedule estimate to be squeezed into profiles of available

funding. Additional requirements, such as high reliability and ease of maintenance, serve to make the fit even tighter.

As a product development proceeds in DOD, its success is still measured in terms of the funding it receives. Success translates into getting the funding request approved each year; failure can mean anything from a significant funding cut to cancellation. This view of success is reinforced by the fact that, unlike commercial programs, DOD programs do not receive full corporate support throughout development. Individual programs face scrutiny by service executives, the Office of the Secretary of Defense, independent cost estimating and test agencies, audit agencies, and several committees and subcommittees of the Congress. Given this amount of competition and oversight, the detection of a problem on an individual program makes that program vulnerable to criticism and possible loss of funding support. Ironically, it is these same pressures that encourage overreaching at the time of program launch. By the time a DOD program makes it through this development process and begins production, the customer is deeply invested and unlikely to walk away. Thus, success, in terms of program continuance, is substantially ensured before end items are produced.

The pressures and incentives in the DOD environment explain why the behaviors of managers and other sponsors of product developments differ from those in commercial programs. According to a 1994 study done for the Under Secretary of Defense for Acquisition, government program managers found their formal role of objective program management at odds with their informal role of program advocates.[3] According to the study:

"A feeling of responsibility for program advocacy appears to be the primary factor causing government managers to search aggressively and optimistically for good news relating to their programs, and to avoid bad news, even when it means discrediting conventional management tools that forecast significant negative deviations from plan."

In this environment, risks in the form of ambitious technology advancements and tight cost and schedule estimates are accepted as necessary for a successful launch. Problems or indications that the estimates are decaying do not help sustain the program in subsequent years, and thus, their admission is implicitly discouraged. An optimistic production cost estimate makes it easier to launch a product development and sustain annual approval; admission that costs are likely to be higher

[3]Critical Issues in the Defense Acquisition Culture, Defense Systems Management College, Dec. 1994.

could invite failure. There are few rewards for discovering and recognizing potential problems early in the DOD product development. For commercial product developments, an optimistic production cost estimate will mean failure of sales or profit; admission of cost increases early invites aggressive problem-solving behaviors to restore the business case. The behavior of tolerating unknowns and not assigning them the same risk value as in the commercial environment is rational in the DOD environment because there is little incentive to admit to high risks before it is absolutely necessary, as long as the resulting estimates are accepted by DOD and the Congress. In fact, admitting risk may doom the program.

Behaviors toward testing follow a similar logic. On commercial product developments, much more is known about the product's performance at the beginning of development. Testing is used to confirm knowledge and identify weaknesses or limits in the product. It is consistent with a firm's anxiety to eliminate unknowns to preclude failure in production. DOD product developments are much more dependent on testing to discover technical performance characteristics and answer the question of whether the product will work. DOD tests serve more than the purpose of discovering or confirming performance characteristics—they are examinations on which the program must get good grades or face failure in the form of withdrawal of support. Good test results can help a program, whereas negative test results are equated with failure. Unknowns, then, present a safer course of action; if testing does not occur until late in the product development, forecasts of product performance will serve as the best information available.

A Rewarding Environment Is Key to Fostering the Best Supplier Relationships

In our work on supplier relationships, we also found that the environment DOD created on an individual program greatly affected the contribution suppliers made to the outcomes of the program. The best supplier practices were sustained when a commercial firm created an environment in which it became an attractive customer. Firms did this by not only rewarding superior suppliers with future business but by building partnerships, allowing top suppliers to participate in product planning and design, sharing business plans, and relaxing the procedures for doing business together. In turn, the key suppliers were willing to go the extra mile, commit their own resources to enhance prospects for future business, and comply with the rigor that the source selection and evaluation mechanisms demanded. The suppliers' responses improved product output and reinforced the initial commitment that the product developer made to strengthening supplier relationships.

Mutual trust—earned through action—was essential to creating this environment. For example, Chrysler's relationships with some suppliers had evolved to the point that it no longer needed to make large investments in some key technology areas because of the relationships it had developed with some suppliers. Instead, the suppliers made the technology investment themselves and had enough confidence in their relationship with Chrysler that they did not fear the long-term commitment that this entailed. For its part, Chrysler trusted the suppliers to make the investments that would keep their vehicles competitive.

On weapon system programs, DOD shares responsibility with the prime contractors for the acquisition policies that shape the suppliers' environment. Thus, the role it plays on individual programs has a direct bearing on the sophistication of supplier relationships and the success of best supplier practices. The supplier relationships on the BAT program reflect DOD's traditional role of distancing itself from suppliers. This role can be traced, in part, to the fact that DOD has not articulated a particular supplier policy to guide program managers. By default, DOD's concerns over interfering with the contractual relationship between the prime and a supplier have encouraged an arms-length approach to suppliers by managers.

Nonetheless, some key BAT suppliers did not see their environment as conducive to such relationships. They viewed their role as only complying with the design requirements handed down to them by the upper-tier firms. They believed that attempts to do more—such as offer design suggestions or make long-term investments—would not reap benefits. Some suppliers believed no consideration was given to their years of working together when it came to the low-rate production contract proposal.

On the JDAM program, DOD was much more proactive and involved with the suppliers. Its status as a pilot program that was afforded early statutory and regulatory relief helped support the program office's involvement in seeing that best supplier practices were used. As a result, high performing suppliers were selected, all tiers of suppliers participated in meeting the program's priorities, and long-term benefits were offered to the prime contractor and its suppliers for good performance. The ultimate success of this approach in producing a weapon that will perform as required remains to be seen. Nonetheless, suppliers praised the approach for the relationships it fostered.

A Broader Perspective of the Acquisition Culture Is a Precursor to Reform

Our findings relative to the different environments that commercial product developments and weapon system programs operate in are consistent with the results of a study we completed in 1992.[4] At that time, we took a retrospective look at the previous 15 years of our reviews of weapon systems and the acquisition process to identify the underlying factors that contributed to recurring acquisition difficulties. We concluded that if changes in the acquisition of weapons were to be of a lasting nature, acquisition problems needed to be looked at from another perspective—as the consequences of a way of acquiring weapons that had become deeply rooted over the years. Those findings have since been reinforced by the 1994 Defense Systems Management College study, which included the participation of 80 experienced government and defense industry acquisition managers.

The acquisition culture can be defined as the collective behavior of the various participants[5] in the acquisition process and the forces that motivate their behavior. In fact, the process may be more realistically portrayed as the interaction of its participants than the methodological procedure depicted on paper. This culture has evolved as the acquisition process has become a vehicle for meeting the diverse needs of its participants. This depiction of the acquisition culture does not stem from a pejorative view of individual participants or organizations. Rather, they do what they believe is right given the pressures they face. The difficulty lies in the fact that there is no consensus on what is right. In the absence of such a consensus, the acquisition process serves to satisfy the diverse needs of its participants within the umbrella of providing U.S. forces with the best weaponry. In so doing, the incentives of the process—both positive and negative—favor maximizing programs.

The acquisition culture offers an explanation for why problems with weapon acquisitions persist despite numerous attempts at reform. Reforms, in essence, have championed sound management practices, such as realistic estimating, thorough testing, and accurate reporting without necessarily affecting why they did not happen in the first place. For example, there have been recommendations aimed at improving the realism of cost estimates, but these are hard to implement when the acquisition process itself does not reward realism. The same can be said about streamlining organizational structure to increase the flow of realistic

[4]Weapons Acquisition: A Rare Opportunity for Lasting Change (GAO/NSIAD-93-15, Dec. 1992).

[5]Acquisition process participants include the military services, the Offices of the Secretary of Defense and the Joint Chiefs of Staff, independent oversight organizations, contractors, professional associations, and the Congress.

information, advocating a "fly before buy" approach to testing weapons before major production commitments are made, and baselining programs in exchange for stable funding and minimal interference.

DOD has embarked on several initiatives that draw lessons from commercial practices, such as cost as an independent variable, integrated product teams, use of past performance data, and performance specifications. These initiatives are based on best commercial practices and are not as compliance-oriented as some past reforms. They could have a positive effect on the outcomes of weapon system programs if the environment for launching programs and appraising risks can be changed to provide the right incentives. In our work on supplier relationships, we found that attempts to apply techniques, such as integrated product teams, were not seen by some suppliers as being effective because their environment had not changed. On the JDAM program, where conditions allowed for a somewhat unique approach, reform initiatives were more effective. Ultimately, if incentives still exist to launch a program with an overly optimistic cost, schedule, and performance baseline, then cost as an independent variable and integrated product teams will not succeed.

Charting a Course of Action for Better Outcomes

We believe the acquisition reforms underway have a sound basis and have the potential for improving the outcomes of weapon systems. We also believe the current leadership is genuinely committed to making a difference in the status quo. However, we are convinced that lasting improvements in the outcomes of acquisition programs will not be realized unless the incentives that drive behaviors in the acquisition process are changed. The first steps to making such changes involve decisionmakers:

- Accepting collective responsibility for the incentives that drive the acquisition process, rather than placing blame on individuals or procedure.
- Agreeing that a cultural focus on acquisition reform—which addresses the "why" or the incentives that affect behavior—is needed to complement the traditional focus on the "how" (process and control) and the "who" (organization).
- Accepting that it is the actions taken and the decisions made on individual programs that communicate the broader message of "what will work" to others in the process. Within the current process, circumstances can usually make a compelling case for taking actions on individual programs that would otherwise contradict sound principles.

Against this backdrop, it is possible for acquisition reforms and commercial practices for gaining knowledge and assessing risks to help produce better outcomes on DOD acquisitions. For such practices to work, however, the knowledge they produce must help a DOD program succeed in its environment. The Congress and DOD can help redefine success in weapons acquisition to make the acquisition environment conducive to such practices. At least two factors are critical to fostering such an environment. First, program launch decisions must be depressurized. That is, they must be relieved of the need to overpromise on performance and resource estimates. This may require altering how decisions are made on determining what weapons are needed. Second, once a program is underway, it must be made acceptable for program managers to identify unknowns as high risks so that they can be aggressively worked on earlier in development. Following are specific actions we have reported on that are in line with addressing the deeper causes of acquisition problems.

Recommendations we have made to the Secretary of Defense include:

- Redefine the point for launching programs as the point at which technology development ends and product development begins.
- On individual program decisions, send the signals that create incentives for acquisition managers to identify unknowns and ameliorate their risks early in development.
- Develop a policy that promotes productive supplier relationships and emphasizes the importance of suppliers in improving acquisition outcomes and communicate this policy throughout the acquisition workforce and the defense industry through training and other means.

Matters we have asked the Congress to consider include:

- Support the Secretary of Defense's efforts to create the right environment through changes to the acquisition process that provide program managers clear incentives for gaining sufficient knowledge at key points in weapon acquisition programs.
- Provide the funds needed to manage technology development efforts outside the bounds of individual weapon system programs, if the Secretary of Defense takes steps to separate technology development from product development.
- Help create the right incentives on individual programs by favorably considering DOD funding requests to mitigate high risks early in a program

and cautiously considering late requests for funds to resolve problems that should have been addressed earlier.

DOD has concurred with these recommendations and says that it will take action. We are encouraged by this and hope to see these actions reflected and supported in funding and other decisions made on individual programs.

Linking Workforce Reductions With Better Program Outcomes

Over the last several years, the Congress has mandated cuts in DOD's acquisition workforce and called on DOD to submit plans to streamline and restructure its acquisition organizations. With DOD's desire to increase procurement funding partially through savings from infrastructure reductions and the need to have better weapon system program outcomes, such actions are called for.

In defense authorization acts for fiscal years 1996, 1997, and 1998, DOD was mandated to cut people from its acquisition workforce. We have reported that DOD most likely will achieve the mandated cuts of 25 percent over 5 years in the acquisition workforce, although the cuts will be offset somewhat by individuals moving elsewhere in DOD and additional functions being performed by contractors. These mandates allow the Secretary of Defense wide latitude to determine how and how much more to cut.

Legislative mandates for significant streamlining and restructuring actions have also been placed on DOD. These actions have had much less success. Section 277 of the National Defense Authorization Act for Fiscal Year 1996 required DOD to develop a 5-year plan to restructure and consolidate laboratory and test and evaluation centers. DOD developed the Vision 21 plan, but its implementation has been put on hold pending decisions on another base realignment and closure round. Section 906 of the same act required the Secretary to submit a plan on how to restructure current DOD acquisition organizations. DOD's response did not assess specific streamlining and restructuring options but rather concluded that its efforts had been sufficient because the workforce had been reduced. In section 912 of the National Defense Authorization Act for Fiscal Year 1998, DOD was again required to address streamlining and consolidating acquisition organizations, this time by submitting an implementation plan to do so. The next report is due on April 1, 1998.

DOD has several related actions underway to redefine and restructure the acquisition workforce. In redefining the acquisition workforce, we encourage DOD to do so in a way that enhances its ability to:

- effectively deliver the training needed to operate successfully in today's unfamiliar environment;
- understand the cost of acquisition functions, whether they be performed by government employees or contractors; and
- accurately identify overlap and duplicative functions between and among the services in setting requirements for, developing and procuring, and supporting weapon systems.

As for restructuring the workforce, DOD has taken actions to reshape the Office of the Secretary of Defense in the Secretary's Defense Reform Initiative to focus on corporate level tasks. The Office's responsibilities must be balanced with the responsibilities of the individual services for equipping the forces to ensure that organizations at all levels support incentives needed to rationalize weapon system requirements and acquire them cheaper, better, and faster. Such issues have yet to be addressed. As the congressional directions indicate, the size, organization, and capability of the workforce DOD relies on to buy equipment is important in determining the outcomes of acquisition programs. And as DOD's actions illustrate, reducing workforce levels is easier than changing the structure that underlies decision-making in the acquisition process. Whether DOD's acquisition workforce and organizations drive the outcomes of the acquisition process or are a reflection of them, they are connected in a way that should be considered in contemplating solutions.

Commercial Pricing of Sole-Source Spare Parts

Mr. Chairman, I would now like to discuss commercial pricing of sole-source spare parts. At this Subcommittee's request, we have begun to examine how and with what information and guidance, DOD contracting officers determine whether prices for sole-source commercial items are fair and reasonable in an environment where there may not be sufficient competitive market forces to control prices. This universe is a small portion of the $100-plus billion that DOD spends on contracting each year. Based on fiscal year 1997 DOD contracting data, about 9 percent of DOD's contracting dollars, or $10.8 billion, went for commercial item purchases, and about 2 percent, or $2.7 billion, represented commercial items purchased without the benefits of competition. We examined selected sole-source contracts to compare commercial prices with prices previously paid by DOD. While our work is not complete, we have been

asked to share our preliminary observations. These observations are based principally on our discussions with contracting officers and other contracting personnel, and on our review of contract files at three Defense Supply Center buying activities, one Air Force buying activity, and one Navy buying activity.

For an increasing number of sole-source spare parts, DOD is transitioning from a cost-based pricing environment that relied on certified cost or pricing data to establish prices to a market-based or commercial pricing environment where price analysis is the principal means used to determine the reasonableness of prices. It is premature, at this time, to draw conclusions about DOD's ability to respond to this new environment.

Views of Contracting Personnel

In our discussions, some DOD contracting officers expressed concern about the breadth of the commercial item definition and are struggling with how to determine whether commercial prices offered by contractors for sole-source items are fair and reasonable, particularly those that are predominately or only sold to DOD. While this concern about the commercial pricing of sole-source spare parts exists today, some contracting personnel expressed more concern about future commercial price negotiations. This is because contracting officers now have recent cost-based prices to evaluate current prices, and they rely heavily on this data to establish a negotiating benchmark for determining price reasonableness. For the future, they expressed concern about their ability to negotiate fair and reasonable prices without the benefit of recent cost-based prices.

Another point that came out in our discussions was the sometimes conflicting pressures on contracting officers to obtain fair and reasonable prices for sole-source commercial items and to get contracts negotiated so that purchases can be made to meet the customer's needs and avoid backlogs. In fact, one buying unit provided us information showing that unfilled backorders for aircraft and ship spare parts are increasing. According to the buying unit's data, unfilled backorders for spare parts increased from around 12,000 in October 1996 to around 29,000 in December 1997. The backlog, according to contracting officials, is caused in large part by the increasing difficulty of negotiating prices in the new commercial pricing environment. At this point in our work, we do not know the impact this backlog is having on aircraft or ship readiness, or how widespread the problem may be.

Review of Selected Sole-Source Commercial Item Contracts

Our review of selected sole-source contracts indicates that some contractors are now offering commercial prices significantly higher than DOD paid in the past. While these price differences, discussed below, are significant, DOD officials and others emphasized that comparing current commercial prices with historical prices alone may not tell the full story, and that one must analyze the makeup of the price, the terms and conditions of the contract, and compare services offered under previous contracts to those to be provided under the new contract. Clearly, DOD contracting officers must understand the basis of commercial prices. Our work raises concerns about how well contracting officers are responding to higher commercial prices.

For example, the Navy purchased material used to repair naval aircraft from a contractor for under $100 a yard prior to its being offered as a commercial item. The manufacturer for this material was acquired by another company, and the acquiring company raised the price to $800 a yard, which represented a discount from its $950 catalog price. The Navy purchased about $1.1 million of this material at the $800 price. According to the Navy contracting officer, the government is the only buyer of this material and it requested the contractor to provide cost information supporting the higher price. The contractor declined to provide cost information and informed the Navy that the offered price was based on the company's financial goals, not on its costs. The contractor referred the contracting officer to its price catalog. The reasonableness of the $800 price could not be tested against commercial sales since there were none. According to the contracting officer, even though he considered the price high, the Navy needed the material to solve a readiness problem.

In another example, on three different occasions from 1994 to 1996, the Air Force purchased from a sole-source contractor an electronic engine control unit as a spare part. Because this component was bought as a commercial item, no cost data was requested or provided. In all, the Air Force bought 54 electronic engine control units for about $19 million. Each time, the Air Force paid the full commercial catalog price, ranging from about $330,000 to $370,000 per unit.

The contracting officer performed no additional price analysis comparing either historical prices or quantities ordered against commercial sales. Such an analysis would have shown that the company recently had sold 949 of these items, of which 82 percent were sold to commercial customers at other than catalog prices. In 1989, the Air Force paid $80,000 each for 18 of these same units. These units were not purchased directly

from the electronic engine control manufacturer, but were procured under a contract with the aircraft manufacturer. Finally, the Air Force, in 1995, purchased from the engine control manufacturer 90 electronic engine controls used on another aircraft engine at a $63,200 unit price.

With regard to commercial prices, our ongoing work has identified other cases where commercially offered or catalog prices are significantly higher than prices previously paid by DOD. For example, the Air Force recently received two such proposals, not yet negotiated. In the first case, in response to an Air Force solicitation for 96 aircraft repair kits, the contractor submitted a commercial unit price of about $3,144, for a total price of almost $302,000. The Air Force's analysis of historical prices showed that it paid only about $900 a unit for 80 repair kits in 1996.

In the second case, the contractor offered a $1,748 unit price for 792 aircraft engine fuel control kits, for a total of about $1.4 million. According to the Air Force's procurement history records, the unit price paid for this item in 1993 was only $464 for 150 of these kits. We were told that after the Air Force questioned the contractor's proposed price as being too high, the contractor verbally offered a 40-percent discount from its catalog, reducing the proposed price to about $1,049 per unit.

In a third case, the Navy received a unit price offer of about $100,000 for communications test set equipment. According to the Navy's procurement history file, the equipment was purchased in early 1995 for around $25,000. The Navy is currently attempting to negotiate this contact. However, to date, the contractor has not provided an explanation for the price increase or any commercial sales data.

The fact that commercially proposed or catalog prices are high relative to past paid prices presents contracting officers with a negotiating challenge. It is clear that initial contractor proposals or catalog prices are the beginning point of the negotiation process and should not be accepted as being fair and reasonable. Sound price analysis and aggressive negotiations are fundamental to DOD's ability to achieve fair and reasonable commercial prices. For example, in a recently negotiated Air Force contract, the contractor had initially offered a 30-percent discount off its commercial catalog prices for about 8,000 engine spare parts. However, the Air Force determined that a significantly greater discount was warranted based on its analysis of historical prices. The Air Force's price analysis was based on escalated historical prices paid for 120 items purchased on a sole-source basis from this contractor and on projected

future demands for these items. The historical prices used in its analysis for many of the items were based on certified cost or pricing data previously obtained from the contractor. After the Air Force raised concerns about the offered discount, the contractor proposed a 61-percent discount off the catalog prices, which the Air Force accepted. Based on the Air Force's projected future buy of the 120 sole-source items, the 61-percent discount represents about a $25-million reduction from the contractor's initial offer.

We support DOD's effort to reform its acquisition process and adopt more efficient commercial practices. Currently, DOD is increasing its effort to purchase commercial products and adopt commercial pricing methods. The current contracting environment for commercial items, particularly for sole-source items where there may be insufficient market forces to contain prices, presents negotiating challenges for DOD contracting officers.

While today's DOD contracting environment is difficult, tomorrow's may be even more challenging. At the present time, contracting officers rely heavily on cost-based historical prices as a baseline for negotiating fair and reasonable commercial prices. In the future, this data will be less available. Whether the risks will be moderated as DOD contracting officers receive additional training in commercial pricing and become more comfortable with price analysis as the primary tool to determine price reasonableness and negotiate commercial prices remains to be seen.

Effectiveness of DOD's Mentor-Protege Program

Section 831 of the National Defense Authorization Act for Fiscal Year 1991 established the Pilot Mentor-Protege Program. The purpose of the program is to provide incentives for major DOD contractors (mentors) to furnish disadvantaged small business concerns[6] (proteges) with assistance designed to enhance their capabilities and increase their participation as suppliers under DOD contracts, other federal government contracts, and commercial contracts. Over the last few years, we have been asked to review various aspects of the mentor-protege program. Most recently, the National Defense Authorization Act for Fiscal Year 1998 requires us to report, on or before March 31, 1998, on DOD's implementation of the program and the extent to which the program is achieving the purposes established by the Congress.

[6]To qualify as a disadvantaged small business, a company must not exceed the Small Business Administration's standards for number of employees or annual sales and must be independently owned (at least 51 percent) and operated by socially and economically disadvantaged individuals.

Our reports have shown a number of implementation problems. For example, in our 1992 report, we recommended, among other things, that DOD develop and implement adequate internal controls in the application and approval process and in the oversight of protege development.[7] In our 1994 report, we were not able to recommend that the pilot program be extended because sufficient information was not available to determine whether the program's purposes could be achieved or whether reauthorization and extension was warranted.[8]

In our latest review, we found that continuing data limitations preclude assessing whether the program is achieving the purposes established by the Congress. DOD has undertaken actions to review the program that are intended to provide the basis for such an assessment. Such actions include conducting a survey of mentors and proteges and requesting the Defense Contract Management Command to conduct performance evaluations of each agreement. However, we believe shortcomings in the survey methodology and incomplete performance evaluations will limit DOD's ability to assess the program's overall effectiveness.

The Congress has appropriated about $233 million for the program since fiscal year 1992. The funding was generally obligated through either cooperative agreements where both the government and contractor work together to obtain a common purpose, separate contracts or line items in DOD prime contracts. DOD has decided that the services and the defense agencies should be responsible for managing reimbursable mentor-protege agreements. In addition, the services have been inconsistent in paying fees to mentors for providing assistance to proteges and reimbursing proteges for various expenses.

After spending over $200 million on its pilot mentor-protege program, DOD lacks information needed to determine the program's effectiveness. Accordingly, in our imminent report, we are recommending that DOD strengthen its performance reviews to ensure that sufficient and reliable information is gathered on planned and actual mentor assistance as well as on the protege firms' business development. In addition, we are suggesting that the Congress may wish to clarify mentor-protege program legislation as to whether mentors can be paid fees in addition to expenses and proteges can be reimbursed for various expenses. Neither the

[7]Defense Contracting: Interim Report on Mentor-Protege Program for Small Disadvantaged Firms (GAO/NSIAD-92-135, Mar. 30, 1992).

[8]Defense Contracting: Implementation of the Pilot Mentor-Protege Program (GAO/NSIAD-94-101, Feb. 1, 1994).

mentor-protege program legislation nor DOD's implementing regulation specifically addresses these expenses.

Multiple-Award Contracts

Concerned that federal agencies were avoiding competitive requirements when ordering under task- and delivery-order contracts, the Congress directed agencies to consider awarding multiple contracts—rather than a single contract—when a task- or delivery-order contract format was planned.[9] To provide for competition in ordering, agencies are to provide each of the multiple contractors a fair opportunity to be considered for orders placed under the contract.

Based on our ongoing work, agencies have not been consistent in achieving competition for orders.[10] One agency issued a high proportion—64 percent—of orders on a sole-source basis. This multiple-award contract has a potential value of over a billion dollars. In another multiple-award contract having the potential to exceed several billion dollars, agency announcements of planned orders identify "recommended" firms specifically invited to submit proposals. This practice has resulted in just one proposal being received on most orders. We also noted that several agencies will increase the value of orders after contractors had been provided an opportunity to be considered. While it may be appropriate to award follow-on or additional work to an incumbent contractor in many circumstances—such as when the work involves continuing development of a system the incumbent initiated—we are concerned that it may not be appropriate in every instance, and that competition could be undermined.

Most contracts included in our review permit other federal agencies to place orders under the contracts. The primary agency responsible for overall contract administration may charge a fee, when other federal agencies place orders under the contract. Fees should be limited to recovering the actual costs under the contract. While agencies generally intend their fees to recover actual costs, weaknesses in accounting and management systems at some agencies obscure comparisons of fees to the costs incurred. For example, one agency charged fees that ranged from $125 to $99,000 for administering a single order under the contract. This

[9]A task- and delivery-order contract provides for an indefinite quantity, within stated limits, of supplies or services to be furnished during a fixed period, with deliveries or performance to be scheduled by placing orders with the contractor.

[10]Our work to date has focused on multiple-award contracts administered by the Defense Information Systems Agency, the Department of Transportation, the General Services Administration, the National Institutes of Health, and the U.S. Air Force's Electronic Systems Center and Standard Systems Group.

agency did not maintain accounting records or develop analyses that would justify this disparity.

Finally, use of the multiple-award contracting mechanism need not impair the ability of small business to compete for federal contracts. Concerns had been expressed that—because multiple-award contracts sometimes consolidated the requirements of numerous programs and offices, and provided for a large and diverse scope of work—small business could not realistically compete for such contracts. The Office of Federal Procurement Policy, the Small Business Administration, and the agencies where we did our work had all taken steps to ensure that use of multiple-award contracts did not exclude small business from the federal marketplace. An adverse effect on small business was not apparent in the statistical data available to date. In particular, small business received half or more of the multiple-award contracts awarded at two agencies, and won orders proportionate with the number of contracts received. The experience of these two agencies suggests that multiple-award contracts can be structured to help participation by small business.

Mr. Chairman, this concludes my prepared statement. I would be happy to respond to any questions you or other Members of the Subcommittee may have.

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